RDECOM magazine
A publication of the U.S. Army Research, Development and Engineering Command (Provisional)
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News Departments

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RDECOM on Track for Success

By Larry D. McCaskill
Research, Development and Engineering Command (Provisional)

Aberdeen Proving Ground, Md.—With less than six months before its official stand-up, the Research, Development and Engineering Command (Provisional) has already made its impact to the warfighter. According to its commander, Maj. Gen. John C. Doesburg, various members of RDECOM gathered to accomplish what it has been designed to do—solve problems and put the latest technology in the hands of soldiers quicker.

Maj. Gen. John C. Doesburg, who was recently named RDECOM commanding general, speaks to RDECOM Magazine about the command's progress towards full stand up in October.

Doesburg said that during the recent war in Iraq, the Iraqi's figured out how to fire at a tank's engine and disable it.

"Our engineers and scientist reviewed the problem and decided that by adding an additional piece of technology, they could eliminate what we call a mobility kill," Doesburg said. "That piece of technology was developed and fielded as we were fighting the war. That is the truest example of putting the latest technology available into the hands of the warfighters."

According to Doesburg, Operation Iraqi Freedom may be the first time scientists and engineers had the direct ability to increase warfighting capabilities and the protection of soldiers literally on a day-to-day basis while we were fighting a war.

"It's truly amazing to see what they've done," he said.

Prior to being selected as RDECOM's first commanding general, Doesburg was the command's transition director. Since assuming command, he said, his job of molding RDECOM has become a bit easier.

"While in the role of transition director, I was focused on establishing the command from the standpoint of providing who ever would be named commander everything they needed, rather than focusing on how I would do it," explained Doesburg. "Now that I've been named commander, I can finish up the formation of the command from the perspective of how I think it ought to be done.

"Most specifically, we're not in the transition mode anymore. We are into the real hard nuts and bolts of setting up the organization."

Doesburg said the biggest challenge to date has been garnering the understanding among all of the Army Materiel Command's Major Subordinate Commands as to the magnitude of change. RDECOM is among the major commands that report directly to AMC.

"Gaining operational control of RDECOM on May 1 helped in a lot of aspects. Now we can start managing our research, development and engineering centers directly, and we can start this business of system of systems integration by putting technology in the hands of the soldiers quicker," said Doesburg.

Doesburg said an important piece of system of systems integration is the Agile Development Center, which AMC Commander Gen. Paul J. Kern and others involved in the initial concept of RDECOM created.

"(The Agile Development Center) is a virtual organization run by Col. (Tom) Stautz. The power of the Agile Development Center is not in the number of people who work there, but in those who work throughout the research and development centers and labs. The center can reach out to the labs and centers and pull the best and brightest together in the area of expertise we need in order to solve that particular problem," explained Doesburg.

"The Agile Development Center was the agent of change for the technology we fielded during the war in Iraq. They worked the problem, solved the problem, then handed it off to the appropriate folks to carry it out. That's exactly what we want them to do—be agile, able to work multiple problems and have the systems set up. This way, once it's working, they now hand it off to the appropriate people who can carry it out and bring it to fruition.

"Currently, the Agile Development Center is working with some of the larger car manufacturing companies that are doing work with fuel cells and developing a relationship with us. Once it is in place, (Col. Stautz) will turn it over to the National Automotive Center to pick up the ball and work the next steps," he continued.

Doesburg explained that the command is on track for full stand up of the organization in October. However, the next major hurdle for the command is paper-thin, but could be a massive roadblock. That critical task is getting the command's documentation in order.

"The reason the documentation is so important is that we are talking about people. It's a people organization. If you don't get the documentation correct, there will always be those issues that come up that affect people. Whether it's pay or promotions, you want to ensure you have it correct so that people, our most critical asset, are taken care of before anything else."

As the organization's agent of change, Doesburg admits that it is sometimes difficult to step back and see how far the command has come since it was established as a provisional command in October 2002.

"There have been many great things accomplished—many things no one thought we would have been able to do at this point in the formation of the command. You don't really realize it because you are part of the process. It doesn't sink in until someone else says 'do you realize what were you able to do?' My response is, 'No, it was something we had to do.' They point out that it was something that was never done before."

Doesburg credits the employees in the field for the speed at which the command has begun to gel.

"During the opportunities I've had to visit the various research labs and engineering centers, I have seen our people embracing the change and beginning to thrive in the new environment. This formation gives many of them the opportunity to literally reach across the depth of the Army's science and technology, research and development, and engineering community," he said.

"We are talking about 14,000 federal employees, 2,400 contractors, almost 300 military staff and a $2.5 billion budget. Pulling all of that together doesn't happen at a headquarters. That happens with the people involved in the various programs. If you have 14,000 folks all pointed in the same direction, just think of what you can do with all of their power, their intellect and their skills. It's truly amazing."

in the lab

Each day, RDECOM's talented scientists and engineers research innovative technologies that position the U.S. Army as the world's premiere land force. "In the lab" highlights recent and on-going initiatives that will benefit soldiers.

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Virtual Reality Improves Prototyping Techniques

Communications-Electronics Research, Development and Engineering Center

Fort Monmouth, N.J.—The tremendous growth within the Department of Defense in the exploitation of rapid prototyping techniques and the development of 3D solid modeling software tools have had a major impact on research and are now impacting system design and development. To keep pace with and to support the rapidly advancing Army doctrines and technologies, the Communications-Electronics Research, Development and Engineering Center developed a computer-based environment to quickly simulate communications systems design and integration before it is turned into a physical prototype.

An engineer uses virtual reality technology to design communication system prototypes at decreased cost, which a customer can review and approve before development of an actual prototype.

Traditionally, the center's rapid prototyping methodology identified and evaluated customer requirements using paper drawings and pro/engineer computer-aided design models. Based on that process, the division would cut metal, run wires and install systems in the hardware prototype for customer review and approval. However, design changes often resulted in significant rework efforts, increasing the cost of the prototype and causing schedule delays.

To mitigate these program risk factors and improve the design-to-build process, the center's System Prototyping Division recently unveiled a new virtual prototyping capability that leverages advances in state-of-the-art 3D virtual reality software and commercial PC-based computer graphics in a low cost configuration.

Now, the center can now produce life-sized, 3D immersive virtual prototypes for customer review and sign off prior to bending metal and running cables. In some cases, the virtual model from one source will be integrated with virtual equipment from another source before any pieces of equipment are fully developed by either source. Virtual reality promotes efficiency of design by providing a decision-making environment that reduces the number of physical prototypes that are used. The result is less costly and better designed prototype systems that can be fielded in a shorter time frame.

By going virtual, the center's System Prototyping Division envisions the ability to provide products, services and deliverables beyond the delivery of hardware. The electronic environment will enable the division to provide products suitable for web- and computer-based interactive multi-media instruction and training. In many cases, the virtual prototype is available well ahead of the actual prototype, allowing for training to be conducted concurrent with the hardware fabrication. In addition, the center can provide products useful in the efficient maintenance and support of the prototype systems it produces, increasing the overall value of the project to the warfighters—its ultimate customers.

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Genetics Help Breed Best Missile Designs

By Jim Bowne

Huntsville, Ala.—The Army Aviation and Missile Research, Development and Engineering Center is concerned about shrinking research and development funds. The center also is concerned about receiving increased requirements to design, analyze and develop complex missile systems that have shortened timelines. However, the center continues to develop creative solutions.

One such solution is the Army Missile Collaborative Design Environment, known as AMCODE.

The Compact Kinetic Energy Missile is among the missiles that benefit from the use of genetic algorithms, which automate and streamline the missile design process.

“AMCODE is revolutionizing the way the center deals with budget shortfalls and condensed timelines,” said George Sanders, an aerospace engineer and AMCODE program manager.

“AMCODE is an electronic environment designed specifically to automate and optimize (the center’s) workflow process in both customer support and technology development programs,” Sanders explained. “It’s also relatively new—something we’ve developed over the past several years that we are now putting into practice. In the past, when we would get requirements from the technical community, it might be months before we were able to arrive at a baseline design. This was not an efficient way to get things done.

“The key to identifying the proper mix of today’s technology to accomplish an electronic collaborative design environment lies in understanding the (center’s) current design environment…as well as adapting the correct mix of tools that both preserve the existing knowledge-based infrastructure and allow rapid access to accurate and up-to-date design information,” he said.

To make this happen, Saunders explained, the center integrated three technology areas—the use of a genetic algorithm missile design synthesis tool; the development of a web-based, centralized project management system; and the detailed design and optimization function.

The genetic algorithm tool uses prediction codes and simulation linked to a genetic algorithm using “digital glue,” a new technology involving scripting languages. The genetic algorithm uses all of the codes to solve a series of best initial design points, based on system requirements and design goals. Technical design information is stored in, and retrieved from, the centralized project management system database, called the AMCODE Data Access Management system.

The third area, the detailed design and optimization function, enables analysis of an existing missile system’s performance by using a simulation linked to computer-aided design, prediction and analysis tools.

The center tasked Auburn University to investigate the use of genetic algorithms to learn its potential benefits to missile design. A missile synthesis tool containing a genetic algorithm was developed that uses the speed and power of today’s computers to fully investigate the missile design space. The tool is provided with mission requirements, design goals and design constraints set by the subject matter experts. It then tirelessly tries thousands of designs, while learning which design features work and which ones do not.

“The genetic algorithm approach produces a starting place in the design process, not the final design. We’re not implying that one engineer sitting behind a computer can push a button and out pops a missile design. The genetic algorithm approach requires that each subject matter expert on the design team be responsible for setting up the boundaries and resolutions that control the design code to give the results legitimacy and credibility. But by using this strategy, we can turn around missile designs in just days. It replaces months of manpower and takes days and, in come cases, only hours to do. We call it the ‘Rapid Concept Exploration Phase,’” said Saunders.

Saunders further explained that AMCODE’s primary benefit is reducing the footprint involved in the design cycle. The system automates and optimizes the time-consuming trade-off analysis necessary to arrive at a suitable starting point in the design process. Moreover, he said, data and information is readily available to all members of a design team.

New Test Center Open for Business

Communications-Electronics Research, Development and Engineering Center

Fort Monmouth, N.J.—The Communications-Electronics Research, Development and Engineering Center recently opened a new facility, called the Mobility Assessment Test and Integration Center, which will be used for testing communications equipment in a mobile field environment. The center officially opened in April in an unprecedented five months from groundbreaking to ribbon cutting.

The communications-electronics center's new test facility, located at the Laguna Pueblo, N.M., supports mobile field testing of communications systems and equipment.

The test center, located at the Laguna Pueblo in Laguna, N.M., provides a unique location for the state-of-the-art control and monitoring facility. The Laguna Pueblo offers more than 430,000 acres with mountains and valleys in a remote environment that is virtually free of radio frequency interference. The test range has been certified as an official National Telecommunications and Information Administration Army Experimental Test Site and provides areas for line-of-sight and terrain obstacle testing. The facility also contains a full-size screen room capable of accommodating a shelter mounted HMMWV, a vehicle integration area and other lab equipment.

The center will provide government and commercial customers the ability to conduct experiments in an instrumented, mobile, field environment with telecommunications and data connections to distant laboratories for evaluation of mobile-networked systems. This field extension will lead to integrated information mobile network remedies for full situation awareness that can be scaled, quickly implemented and used across the Joint Services.

Testing at the facility has the potential to include other programs, such as networking radios including the Joint Tactical Radio System and Small Unit Operations; unattended and robotic sensors; advanced antenna systems; antenna positioning/tracking terminals; airborne relay platforms; and Unmanned Aerial Vehicles.

Natick Opens Food Pathogen Testing Lab

Natick Soldier Center

Natick, Mass.—Natick Soldier Center's Combat Feeding Directorate is expanding its role in food safety with the recent opening of the Food Pathogen Testing Lab. The Combat Feeding Directorate's mission is to provide safe and nutritious food to all of the Armed Services. This new lab expands the directorate's ability to protect the military's food supply, as it will be used to test prototype and commercial systems' ability to detect pathogens and intentional bioterrorism acts in food.

The lab's immediate customers are the Veterinary Services Activities and the Army Medical Research Institute of Infectious Diseases. In addition, the directorate is collaborating with the U.S. Department of Agriculture and the Food & Drug Administration, including the FDA's Centers for Disease Control and Prevention.

Specifically, the directorate is working jointly with FDA and USDA to develop assays and optimize protocols for food pathogens and agents to protect the warfighter, as well as to support Homeland Defense efforts to safeguard the public.

The directorate also is converting an existing laboratory into a Bio-Safety Level II plus lab to conduct food-related research on naturally occurring and intentionally disseminated pathogens and toxins. To ensure the highest regard for public and worker safety, the directorate will implement security measures above and beyond state and federal requirements. For example, the only scientists who will work in the lab have been trained by the Massachusetts State Department of Health, which operates under CDC training and approval.

Natick's Combat Feeding Directorate is one of few research facilities with strong expertise in food-related research. The directorate's partnership with the USDA, FDA and CDC, in particular, will have the benefit of combined resources and expertise to maximize food safety.

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Improved Protection Against Close-In Attacks

By Rae Higgins

Warren, Mich.—It's been said good things come in small packages, and the Tank-Automotive Research, Development and Engineering Center's Hit Avoidance engineers and scientists wholeheartedly agree. Patents are pending and soldiers are waiting for what the engineers call little lifesavers, 6-pound countermeasure rounds that defend Army vehicle crews against close-in attacks from hand-held, high-explosive antitank threats, such as rocket-propelled grenades and small antitank-guided missiles.

The tank-automotive center's Full Spectrum Active Protection Close-In Layered Shield protects Army vehicle crews against close-in attacks from hand-held, high-explosive antitank threats, such as rocket-propelled grenades and anti-tank guided missiles.

Dubbed the Full Spectrum Active Protection Close-in Layered Shield, the center is leading this effort with the Army Research Lab and the Armament Research, Development and Engineering Center.

An active protection system "detects, tracks, intercepts and physically defeats large-caliber threats at a distance sufficiently far from the defended vehicle to reduce the lethal effects of the threat and (ensure) vehicle survival," said Jim Soltesz, the Army's Full Spectrum Active Protection Science and Technology Objective manager and the center's Hit Avoidance team leader.

The Close-In Layered Shield, he said, complements a long-range system or can be used as a stand-alone system. It is the first self-contained, lightweight, close-in U.S. active protection system surpassing all other world capabilities. Within half a second, it conducts surveillance and target acquisition, tracks the threat, and launches, fuzes and detonates the countermeasure to defeat the incoming threat.

Jim Revello, the system's program manager, said if the Army fielded this system, it would significantly impact battlefield capabilities, especially in urban environments, by saving lives and equipment. Further, it has proven successful versus various types of threats in recent field testing.

"There's a real need to address the close-in threat," Revello said. "You watch the news every night and it's (rocket-propelled grenades), not tanks and smart weapons, that are killing people."

Soltesz and Revello view the new shield as a permanent fix, rather than a quick fix, to defeat close-in threats. In fact, a patent is pending for their design. It is a cross-technology solution integrating countermeasure, radar, digital signal processing and explosives in a small, safe self-contained assembly ready for loading into either a smoke tube or an upgraded tube, Soltesz said.

Despite the shield's inventiveness, it boasts "elegant simplicity in design," Revello asserted. "It is simple, inexpensive and effective—and leverages technologies from existing programs."

Revello also said the shield would be easily integratable into emerging vehicle concepts or legacy platforms, because vehicle designers, engineers, soldiers and contractors are already familiar with smoke tube launchers.

Additionally, it would prove beneficial to other services and federal agencies. For example, Revello explained that it can be easily integrated into several U.S. Marine Corps vehicles and Navy weapons systems; would provide protection for Air Force rotary wing

aircraft and potentially could defend fixed wing aircraft against close-in attacks; would enhance Special Forces rotary wing aircraft and specialty vehicle survivability; can be leveraged by other federal agencies like the Departments of Energy and Treasury to combat terrorist threats against key buildings, facilities and vehicles; and can be used to protect oil refineries, power plants and other critical assets.

"(The shield) is a system that should be in the field now," said Soltesz. "It's a viable, cost-effective, easily integratable solution to a very real threat out there. (It) can—and will—save soldiers' lives. It's that simple."

in the field

RDECOM's primary mission is to get the right technologies in the hands of soldiers faster. "In the field" features technologies and systems developed by RDECOM that have been recently fielded or deployed to soldiers.

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Speakers Help Save Lives

Communications-Electronics Research, Development and Engineering Center

Fort Monmouth, N.J.—Audio loud speaker systems provide critical support to soldiers in the field. The Communications-Electronics Research, Development and Engineering Center recently improved the military's audio technology capabilities with the Family of Loudspeakers System. The new speaker system supports various operations, such enemy prisoner of war control, crowd control, humanitarian aid and disaster relief.

The communications-electronics center's new Family of Loudspeakers can be mounted on a variety of platforms, such as the HMMWV.

The system was developed and fielded in a variety of configurations for the Army's Special Operations Forces Psychological Operations units. For example, a man portable version is battery operated and can be carried by a soldier in a standard field pack. The higher-powered vehicle version is shock mounted on either an M-1025 or M-1114 HMMWV, and the maritime version is mounted on the Special Operations Mark V patrol craft and is ideal for detaining or instructing suspicious watercraft. The highest power version is mounted on the Blackhawk helicopter.

In addition, the system can broadcast live or prerecorded messages from a cassette player, minidisk, internal digital voice recorder or wireless microphone, providing flexibility to the end user. It also can support new commercial devices, such as MP3 players.

In addition to providing the basic system, a variety of installation kits were developed to ease mounting/dismounting of the system to various platforms. According to Steve Singleton, senior logistician, "…the aircraft installation kit that the Command and Control Directorate designed and produced allows rapid installation and removal on the UH-60 Blackhawk."

The highest power version of the new loudspeaker system can be mounted on the Blackhawk helicopter.

Various tests were completed to ensure the system met all requirements. For example, environmental testing was conducted to assure that the system could survive the rigors of deployment anywhere in the world.

"Our lab test guys, Karl LaSala and Dave McCauley, know first hand through years of extensive testing how well this system could disturb any foe or get the attention of good citizens," said Steve Zitzmann, the Environmental Test Facility's on-site leader. "During tests on the system, it was so loud that the Fort Monmouth police visited the lab many times (saying) they received complaints from throughout the area that the volume be lowered."

Zitzmann also explained that a low frequency speaker was added to the vehicle versions to make the system sound more realistic. In addition, the entire speaker assembly can be rotated 360 degrees to reach targeted audiences or to achieve "surround sound" effects.

The system is being used in all theatres of operations worldwide. Many dedicated research center employees worked for several years on the program and are thrilled to see that many lives, both military and civilian, are being supported by the new speaker system.

The maritime version of the new Family of Loudspeakers can be mounted on the Special Operations Mark V patrol craft and is ideal for detaining or instructing suspicious watercraft.

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New Battlefield Simulation Training Hones Warfighting Skills

Simulation Technology Center

Orlando, Fla.—The Simulation Technology Center recently demonstrated a tutoring system called Battle Command 2010, a desktop training system that develops and hones warfighting skills in a virtual environment.

Also called BC2010, the program was developed in coordination with the Army Battle Command Battle Lab at Ft. Leavenworth, Kan. The program also evaluates participants' success through an after-action-review and enables personnel to train individually or collaboratively.

The Army successfully used the BC2010 at the Command and General Staff College, located in Ft. Leavenworth, Kan., and during a 3rd Brigade, 1st Infantry Division, command post exercise in Vilseck, Germany.

In the recent demonstrations, participants performed as members of a virtual battle staff and developed a battle plan based upon a scenario in the simulation. Then, the tutoring system successfully critiqued the plan and provided feedback to the participants during the planning phase of the simulation. Next, the staff modified and executed the new plan in the simulation based upon this feedback. Finally, the system evaluated the staff's actions as the simulation unfolded and provided feedback at the end of the simulation. All of this was accomplished without live instructors participating in the exercise.

BC2010 is a significant improvement over previous versions of the system, which relied on instructors' evaluation and feedback on personnel performance. Incorporating the new tutoring system standardizes the assessment process, facilitates training during periods when instructors are not physically present and supports the concept of providing training anytime, anywhere.

Many of its features are still immature, and additional research is needed. The center will conduct new research in three areas. First, it will develop a general-purpose architecture allowing tutoring system interoperability with other distance-learning tools. Second, it will explore the feasibility of intelligent tutoring system learning, allowing the subject matter expert knowledge base and post-analysis feedback component to mature. Third, the center will explore methods for extending tutoring capabilities to include coachless mentoring of teams and groups of soldiers in the future.

Intelligent Tutoring System technology holds genuine promise for improving distance- learning environments. Combining it with a low-cost simulation and well-designed instructional content provides a powerfully effective training tool for soldiers. New technologies such as intelligent tutors, low-cost simulations and leveraging the power of the Internet are essential to advancing training transformation in the Army.

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New Transportation Device Eases Travel for Soldiers

By Hallie Goldfarb

Picatinny Arsenal, N.J.—Picatinny Arsenal is experimenting with a new tool named the Segway that is the first of its kind—a self-balancing, personal transportation device that is designed to operate in any pedestrian environment.

Tabitha Sawicz, an engineering intern from the Mortars Team, tries out the Segway. *Photo courtesy of the Program Manager for Mortars*

"The Segway is a two-wheeled, self-balancing platform, which uses five electronic sensors in its base that recognize changes in movement," said John W. Grassia, deputy program officer for Mortar Weapons/Future. "If the rider leans forward or backward, the system will effortlessly move with them."

Prospective benefits of the Segway deal with logistic issues that would speed up the physical movement of soldiers and increase their carrying capacity for handling equipment. Another benefit occurs in situations that require patrol, surveillance or routine movement of personnel in and between buildings.

The inventor, Dean Kamen, explained in a Time Magazine article, "…when you use a Segway, there's a gyroscope that acts like your inner ear, a computer that acts like your brain, motors that act like your muscles and wheels that act like your feet."

According to Grassia, the machine is powered by two batteries, which can go 17 miles with one charge. The Segway can carry a 250-pound rider and up to 70 pounds of cargo. It can also travel from 5 to 17 mph and weighs 65 to 80 pounds. The cost of the machine is $8,000 for industrial models, and consumer model versions may cost $3,000.

"(Armaments Research, Development and Engineering Center) Technical Director Michael Devine and (Fire Support Armament Center) Commander Peter Janker encouraged the purchase of three of these systems for (the center's) evaluation to impart a spark of inventiveness back into the workforce with new inventions…so we can continue to lead with state-of-the-art technology," explained Grassia.

"(The center) will be looking at possible application of the vehicle/driver interface, as well as the method of platform stabilization," he said. "(The Explosive Ordnance Division) also will be identifying any potential field applications where the Segway could function to carry inspection equipment into operations. (The program manager for Mortars) also is evaluating them for potential military application, specifically mortar application."

partnership

RDECOM partners with industry and academia to capitalize upon advancing technologies and to develop the next generation of scientists and engineers. RDECOM Magazine's "partnership" news department highlights the command's successful collaborations with industry and academia.

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Michigan Junior High School Team Wins E-Cybermission Contest

By Paul D. Mehney

Warren, Mich.—Four eighth grade girls from Malow Junior High, located in Utica, Mich., stole the spotlight at a star-studded event in Washington, D.C., winning the Army-sponsored E-Cybermission National Competition.

After touring the nation's capitol, the team, named the "Brilliant Girls," dined with the Army's elite, including Army Chief of Staff Gen. Eric K. Shinseki, and received their award for developing a code based enhancement package to the current 911 emergency system.

(fifth from left) Jerry Pantano, advisor, poses with the winning eCybermission team members Sara Craun, Sara Kusminski, Marissa Munaco and Lauren Palmer.

E-Cybermission is the Army's science, math and technology Web-based student competition. The Army created the program in October 1992 a way to foster math and science skills in middle school students, but also to get the nation's future leaders thinking about community problems and how to solve them through teamwork.

To spread the word about E-Cybermission, engineers and researchers from the Tank Automotive Research, Development and Engineering Center, headquartered in Warren, Mich., traveled to Detroit area schools explaining how seventh and eighth grade children can become involved in the program.

After learning about E-Cybermission, Malow Junior High team members identified a mission theme of health and safety and researched a community safety issue. Team members were concerned that when a person calls 911, "it sometimes takes a while to get through," and "found a way to quickly get through when there is an emergency."

With guidance from their Malow team advisor, the girls researched problems in the 911 system response time and identified the most common 911 calls. Using the information, the Brilliant Girls devised a coding system for certain types of emergencies. By pressing a corresponding key on a touch tone phone's key pad, a caller could alert 911 to the specific type of emergency and, in the case of cell phones, a GPS system would inform the operator to the exact location of the caller.

According to Lauren Palmer, a member of the Brilliant Girls, "We really wanted to work on something that would save lives. We saw on the news that more than half of the 911 calls made from cell phones were disconnected before the message could be completed. We knew then that we wanted to make a difference in the community."

To win the national award, which included a $5,000 U.S. savings bond per student, Malow's Brilliant Girls beat out 442 other E-Cybermission teams from across the nation.

According to TARDEC Director Dr. Richard McClelland, “TARDEC is incredibly honored by the manner in which the Brilliant Girls represented their school and the entire Detroit area. We owe them a great deal of credit for their technical prowess, diligence in completing their project and the professional manner in which they conducted themselves on our behalf.”

Riding this year’s success, the Army looks forward to an expanded program for the 2004 school year, including opening E-Cybermission competition to all students from grades six to nine.

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International Information Exchange Agreements Simplified

By Jerry Rubin

Picatinny Arsenal, N.J.—The Research, Development and Engineering Command seeks to identify technology opportunities from research activities domestically and around the world. RDECOM's efforts to shorten the timeline to acquire foreign technologies has been significantly streamlined now that the command's technical directors have the authority to sign unclassified information exchange agreements with foreign governments.

ARDEC Technical Director Michael Devine (far right) signs the first international technology information exchange annex with the Republic of South Africa as part of a new system that enables technical directors to establish such partnership agreements with foreign governments. The team responsible for establishing the annex witnesses the signing: (from left) Roger Zimany, associate technical project officer; Naomi Howard; Mike Chiefa, technical project officer; Jerome Rubin; and Lu Ting. *Photo by Todd Mozes*

The basic document authorizing technology information exchanges between the United States and a foreign government is called the Master Information Exchange Agreement. After this agreement is in place, an "annex" is developed with the partnering country to outline the specifics of the information exchange.

Historically, the process the Army used to establish a data/information exchange annex sometimes took years due to multiple reviews at the Army Materiel Command and Department of Army levels.

Thanks to concerted lobbying by the International Points of Contact and the Armaments Research, Development and Engineering Center, AMC Commander Gen. Paul J. Kern recently authorized technical directors to process and sign all new unclassified annex/information exchange agreements developed by the research centers.

The armaments research center Technical Director Michael Devine recently signed the first agreement under this new process with the Republic of South Africa. The center also has previously established annexes with nine countries for exchanges on technology for artillery, mortars, infantry weapons, energetics, mines, medium caliber systems, small arms, demilitarization and tank armament systems.

Pullquote: RDECOM's efforts to shorten the timeline to acquire foreign technologies has been significantly streamlined now that the command's technical directors have the authority to sign unclassified information exchange agreements with foreign governments.

Caption: (contract sign.jpg) ARDEC Technical Director Michael Devine (far right) signs the first international technology information exchange annex with the Republic of South Africa as part of a new system that enables technical directors to establish such partnership agreements with foreign governments. The team responsible for establishing the annex witnesses the signing: (from left) Roger Zimany, associate technical project officer; Naomi Howard; Mike Chiefa, technical project officer; Jerome Rubin; and Lu Ting. Photo by Todd Mozes

Technology Alliance Encourages Partnering

Army Research Laboratory

Adelphi, Md.—More than 600 representatives of academia, industry and government attended the Second Annual Collaborative Technology Alliances Conference, which was held this spring at the University of Maryland.

Visitors look over an unmanned robotic vehicle at the recent Second Annual Collaborative Technology Alliances Conference held at the University of Maryland. The program encourages government, industry and academia to share expertise and facilities and work together in technology areas that are crucial to the Army.

"The conference provides an outstanding forum for industry, academia and government collaboration in research for the Army's transformation," said Dr. John W. Gowens, conference chairman. "The future focus is to discover technology that's ready for immediate transition to the Objective Force," he said.

The Army Research Laboratory established five technology alliances in May 2001 using competitive procurement. The alliances are in the areas of advanced sensors; power and energy; advanced decision architectures; communications and networks; and robotics. The projected scope of each alliance is approximately $35 million over five years and $20 million for a three-year option.

Under the alliance, several changes have been made to improve the program, such as establishing a research management board that extends participation to other Army organizations, government agencies and military branches. In addition, a provision allows the laboratory to withhold up to 10 percent of annual funding for innovative research outside the alliance program.

"What we have is a triad that contains the government, academia and industry. ARL is a full member of this research triad, and we make a valuable contribution to the Army," said Gowens, who also serves as chief of ARL's computer and communication sciences division and collaborative alliance manager for communications and networks.

Natick Selects Eagle Enterprise for Objective Force Warrior Program

Natick Solder Center

Natick, Mass.—Natick Solider Center selected Eagle Enterprise Inc., a division of General Dynamics of Westminster, Md., to assist in the center's efforts to improve soldier survivability, enable greater combat lethality and provide networked communications between soldiers and other combat platforms, such as the Future Combat Systems and Comanche helicopter.

"As the government lead for this program, I am very pleased with and appreciative of the partnering and support this program has received from the Army's (science and technology) community," said Philip Brandler, the center's director.

The center maintains government management responsibility for the program, which is called the Objective Force Warrior Advanced Technology Demonstration, or OFW. The center has been the home for the development of such technology for nearly everything the soldier wears, carries, consumes and uses for shelter.

"This event is a major milestone for Army Transformation," said Assistant Secretary of the Army for Acquisition, Logistics and Technology Claude M. Bolton, Jr. "Transformation of the soldier is fundamental to the Army's transformation to the Objective Force. This program will be instrumental in achieving that vision."

Eagle Enterprise Inc. will receive $100 million for the 25-month Phase II portion of the project, which involves preliminary and detailed design. The cost of the 15-month Phase III, demonstration build, training and demonstration, will be negotiated with Eagle Enterprise Inc. during Phase II. This program continues efforts begun last year to conceptualize, design and demonstrate a revolutionary soldier "system of systems," a concept that will be demonstrated in 2006.

"Army transformation is all about networking soldiers with weapon systems, vehicles and aircraft to create a joint, integrated fighting force with overwhelming and devastating power," said Lt. Gen. John Riggs, director, Objective Force Task Force. "OFW forms the heart of the soldier-centric Objective Force."

The Objective Force is the Army's future full-spectrum force: organized, manned, equipped and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable and sustainable across the entire spectrum of military operations.

The tenets of the Objective Force are to enable the Army to see first, understand first, act first and finish decisively in all aspects of armed conflict—from major theater war through peacekeeping missions and homeland security.

"Through the OFW program, the Army is seeking to achieve a paradigm shift in warfighting capability for individual soldiers," said Deputy Assistant Secretary of the Army for Research and Technology A. Michael Andrews.

The OFW system of systems will equip U.S. soldiers with speed and precision for decisive full-spectrum operations. Enabled through a seamless network, the OFW soldiers will have unprecedented battlefield knowledge, standoff precision lethality, ballistic survivability and mobility capabilities available today only in "platform-based" forces.

The OFW systems architecture will provide full integration into the Future Combat Systems unit of action, establishing the OFW soldier as the powerful centerpiece of these formations. Perhaps most impressive of all is that the OFW science and technology

program seeks to provide all of these unmatched capabilities while reducing the soldier's physical load by 50 percent, down to less than 50 pounds.

OFW will transition to Program Executive Office-Soldier for development and fielding as Land Warrior-Advanced Capability.

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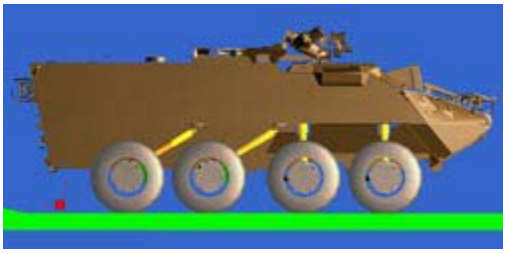
Physics-of-Failure Ensures Weapon System Reliability

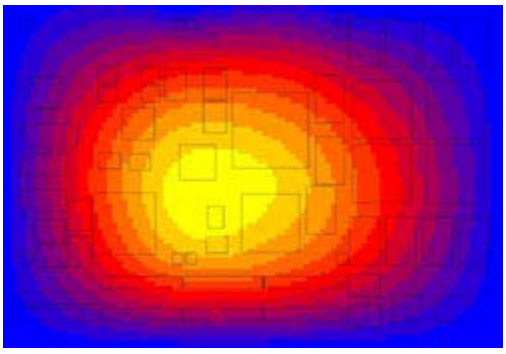
By Dr. Thomas Stadterman and Dr. David Mortin



Mechanical Simulations International developed the dynamic simulation of the Stryker, which produces the force and acceleration time history of the vehicle traversing terrain. This information will be used in the suspension component fatigue analysis.

Aberdeen Proving Ground, Md.—The Army Materiel Systems Analysis Activity and a team of leading engineering and analysis organizations continue to expand "physics-of-failure" technology applications to Department of Defense weapon systems to improve reliability and reduce costs. Physics-of-failure is an engineering-based approach to determining reliability. It uses modeling and simulation to eliminate failures early in the design process by addressing root-cause failure mechanisms in a Computer-Aided-Engineering environment. This approach is proving essential for meeting Army and Department of Defense transformation objectives.

Physics-of-failure analyses have been successfully performed for many Department of Defense systems resulting in improved reliability and millions of dollars in savings. Electronics have been analyzed in numerous systems, including radar ground stations, hand-held monitors, helicopters, tracked vehicles, wheeled vehicles, power supplies and missiles. Mechanical structures have been analyzed on Army trailers, floating bridges, dry bridges and tracked vehicles. Reliability improvements were applied to many of these systems, which resulted in fewer field failures and significant cost benefits.



University of Maryland software was used to calculate the displacement of circuit cards during vibration. This information was used to estimate component life.

This effort includes a collaborative team of Army organizations and foreign militaries, including the Armament Research, Development and Engineering Center; Tank-Automotive Research, Development and Engineering Center; Aberdeen Test Center; Developmental Test Command; Army Research Laboratory; Army Evaluation Center; and the Australia, Canada and the United Kingdom Ministries of Defense. This team also includes the leading organizations from academia such as the University of Maryland Computer-Aided Life Cycle Engineering center, the University of Iowa Center for Computer-Aided Design and the University of Tennessee. This collaborative teaming arrangement has greatly advanced the Army's ability to design reliability into systems early, thereby reducing the possibility of costly redesigns and schedule delays.

One of the many examples of physics-of-failure success was for commercial-off-the-shelf circuit cards used in a wheeled-vehicle system. The analysis showed that the circuit cards could be used in the system without reducing system reliability, which decreased the acquisition costs of the electronics by $12,000 per circuit card and over $1 million during initial production.

Another analysis was performed on a tri-service radio, which identified a failure mechanism that would cause the radio to fail repeatedly. Different components were used to remove this failure mechanism. The estimated operating and support cost avoidance was $27 million from the elimination of transportation, repair and spare parts associated with the failures. The Army Materiel Systems Analysis Agency, also called AMSAA, currently is performing analysis on electronics used in missile, helicopter and tracked-vehicle systems.

The solid model of the trailer was used to develop the dynamic simulation and finite element models used in the physics-of-failure analysis.

In addition to electronics, the tools have been applied to Army bridging systems. AMSAA served as the accreditation agent for physical simulation undertaken to address bridge durability. In this capacity, AMSAA monitored the physical simulation and validation activities, reviewed the data and performed independent physics-of-failure analysis to quantify the levels of fatigue imposed in the bridge structures from both the real world and simulated events. For the Improved Ribbon Bridge, results of the analysis were used to avoid a lengthy retest and to support an Urgent Materiel Release for fielding to Iraq. Estimated savings from this analysis were $1 million. AMSAA currently is working on other bridging systems and a bridge erection boat used for the Improved Ribbon Bridge.

An Army team, including the Universities of Iowa and Tennessee, performed a comprehensive physics-of-failure analysis on an Army trailer that was experiencing fatigue failures. The analysis represented the first documented use of an integrated process of testing for model inputs, dynamic simulation to produce loads, extensive validation testing and fatigue analysis. Results from this analysis indicated that the trailer drawbar would experience fatigue failures after use on cross-country terrain. Using University of Iowa software, an optimized design based on weight and fatigue life was developed for the drawbar. If this analysis was performed during design, millions of dollars of redesign and test cost could have been avoided.

Physics-of-failure continues to be an award-winning initiative that enables the Department of Defense to reduce logistics footprint and produce military platforms with the high levels of reliability that our soldiers deserve.

people

RDECOM's talented scientists, researchers and engineers are among the top in their field. The "people" section includes news and feature articles about the command's diverse staff, including profiles, awards and other accomplishments.

Contents

Bochenek Becomes First Female to Lead Tank-Automotive Center

By Rae Higgins

Warren, Mich.—June 17, 2003, is a date to remember for the Detroit Arsenal history books. It is when Dr. Grace M. Bochenek officially became the first female named to lead the Tank Automotive Research, Development and Engineering Center as executive director for research and technical director. Bochenek also joins the ranks of the federal government's Senior Executive Service.

Dr. Grace M. Bochenek becomes the first female assigned to lead the Tank-Automotive Research, Development and Engineering Center as director.

As the center's research director, Bochenek leads programs to align all ground-based systems science and technology research objectives to meet the Army's future war fighting and logistics needs. Specifically, she oversees vehicle survivability, ground robotics, propulsion, vehicle electronics, track and suspension, water purification, tactical truck technology, combat engineering and electric drive technology research.

Bochenek has been a federal employee for nearly 20 years. She has technical and managerial experience in simulation, virtual reality, system design and acquisition, virtual prototyping, research, development, engineering, program management and joint international programs.

She also provides technical direction for many of the Army's science and technology objectives. Additionally, she is actively engaged in North Atlantic Treaty Organization efforts and is co-chairing the Army's 2003 Simulation and Modeling for Acquisition, Requirements and Training Conference, which will be held in Dearborn, Mich., this September.

Edgewood Center Provides Opportunities for Challenged Teens

Edgewood Chemical Biological Center

Aberdeen Proving Ground, Md.—As a participant in the Free State Academy's National Guard Challenge, the Edgewood Chemical Biological Center is helping Maryland's challenged youths find direction and inspiration in the leading edge science found at the center.

This spring is the second time ECBC has supported the job shadow component of the National Guard Challenge. The Free State Academy conducts two sessions of the voluntary five-month program each year, offering 100 challenged teenagers between the ages of 16 and 18 an opportunity to gain a high school diploma and real-world workplace experience.

Participants, known as cadets, live at Aberdeen Proving Ground in a structured environment, receive schooling and may participate in a job shadowing program. Approximately 40 of the 100 cadets will find opportunities as job shadows, where they will work for two days each week for a month with a particular organization or group. A job fair is held after each session of the Academy, resulting in 70 percent of participating cadets either joining a branch of the military or enrolling for continued education.

A number of teams within ECBC's Engineering Directorate have hosted Free State cadets, from the computer aided design and engineering group to the mask test team and the environmental field testing team. In May, the latest group of cadets arrived in uniform to tour the Engineering Directorate's facilities and learn about the work ECBC engineers conduct. After touring the potential job shadow sites, which include military organizations as well as commercial placements, the cadets submit their interests to the leaders of the Free State Academy in hopes of securing one of the shadowing slots.

According to ECBC's Ron Pojunas, ECBC is usually one of the top choices. "We were impressed right from the start with the organization and the results," said Pojunas. "The concept is to place the cadets in a mentoring environment and give them hands-on experience and direction. Many cadets go on to college and the services."

In the fall 2002 session, ECBC accommodated eight cadets in a range of situations within the Engineering Directorate. Mark Schlein, leader of the Computer Aided Design/Computer Aided Engineering labs, hosted two cadets within his group. Schlein said the cadets made a unique keepsake. They used sophisticated scanning and fabricating equipment to scan their faces and hands electronically and used the resulting molds to make a metal plaque commemorating their participation, which was presented to the Free State Academy. It currently is on display at their headquarters.

"It's always possible that (cadets) might come back to ECBC eventually, but this is really about them," said Schlein. "Through the mentoring, we emphasize the different levels of education you need to do different kinds of technical work…this is something the kids haven't seen before."

news briefs

The "news briefs" section provides quick summaries of various news and events from throughout RDECOM.

Contents

New Decoy Flares Protect Against Missile Attack

By Robert Ritchie and Kendra Archbald

Picatinny Arsenal, N.J.—The Army recently classified two new infrared countermeasure flares that will enhance aircraft survivability against the most sophisticated infrared guided missiles. The new decoys, designated as the M211 and M212 aircraft countermeasure flares, were developed under the Armaments Research, Development and Engineering Center's Advanced Infrared Countermeasure Munition program.

The M206, M211 and M212 aircraft countermeasure flares protect Army aircraft from missile attack by acting as decoys.

The program currently is being developed for low flying, slow moving rotary wing aircraft and is one of two major Department of Defense infrared decoy development programs. The M211 and M212 flares will supplement the M206 aircraft countermeasure flare currently utilized by Army aircraft. The three flares will be used in a timing and sequence that has been optimized, through flight-testing and computer simulations, to decoy the threats.

Most recently, the M211 and M212 flares were used to protect aircraft during combat operations in Afghanistan and Iraq. The aircrews reported the countermeasures were effective in defeating multiple missiles fired at them. This January, the technology was deployed to the 101st Airborne Division as an urgent material release. In addition, the 160th Special Operations Aviation Regiment has used this technology in the field since early 2000 on MH-47 and MH-60 helicopters.

A Chinook helicopter dispenses countermeasure flares during testing.

Picatinny Receives Energy Savings Rebate

By Richard Havrisko

Picatinny Arsenal, N.J.—Picatinny Arsenal recently received an energy savings rebate check in the amount of $23,057.60 for its energy conservation efforts. The rebate was received for the installation's energy efficient lighting, occupancy sensors, motors and variable speed fan drives installed under an Army Corps of Engineers construction project for the Armament Software Engineering Center.

Jersey Central Power & Light representative Rosemary Norton presented the rebate check to Garrison Commander Lt. Col. George Crone, Jr. at a recent ceremony. JCP&L participates in the SmartStart Buildings program, which is a statewide energy efficiency program approved by the New Jersey Board of Public Utilities and administered in joint effort by the New Jersey electric and gas utilities.

Customers of these utilities who are constructing, expanding or replacing energy consuming equipment are eligible to participate in this rebate program through their utility companies.

Jersey Central Power & Light representative Rosemary Norton (right) presents an energy savings rebate check to Garrison Commander Lt. Col. George Crone, Jr. at a recent ceremony. *Photo by Todd Mozes*

Value Engineering Program Ensures Cost Savings

By Ferdinand del Carmen

Picatinny Arsenal, N.J.—The Armaments Research, Development and Engineering Center was recently credited with $19,686,000 of cost savings/avoidance as part of the center's Value Engineering Program.

The Value Engineering Program is designed to identify cost saving opportunities using systematic and creative ways to identify and analyze systems, components, functions and business practices. The program encourages the center's workforce to initiate traditional and nontraditional ideas ranging from production enhancement and manufacturing to novel contracting.

monthly features

Each month, RDECOM Magazine features articles on specific aspects of the command's mission. The “monthly features” section enables readers to learn more about the command's diverse mission and activities.

The July 2003 edition of RDECOM Magazine features articles on the command’s award-winning initiatives that demonstrate RDECOM’s position at the forefront of cutting-edge, warfighter technology.

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RDECOM Simulation Game Wins at Electronic Expo

by Patricia McAllister

Orlando, Fla.—The Army's simulation game, Full Spectrum Warrior, won two prestigious awards after its debut at the recent 2003 Electronic Entertainment Expo in Los Angeles. Full Spectrum Warrior captured the categories of "Best Original Game" and "Best Simulation Game." The expo, which also is called E3, is considered the game industry's version of the Academy Awards.

Full Spectrum Warrior is a squad-level, dismounted, light infantry training simulator created for play on a Next-Gen Console. Full Spectrum Warrior helps develop squad leaders' critical tactical decision-making skills. These decisions are made while under fire in tactically and politically complex military operations in urban terrain environments. Designed to simulate today's challenges of urban combat missions, Full Spectrum Warrior delivers a level of realism and accuracy never before seen in a military-based game.

It was the most nominated game in the prestigious "Game Critics Awards—Best of E3 2003" category. Full Spectrum Warrior was nominated in four additional categories, including "Best Original Game," "Best Simulation Game," "Best Console Game" and "Best of Show," garnering more nominations than any other game at E3.

The Game Critics Awards are the only independent E3 awards, voted on by editors from nearly 40 leading outlets covering games—including top magazines, online sites, newspapers and television programs.

Jim Korris, creative director at the University of Southern California's Institute for Creative Technologies, said the awards are significant. "These (judges) are the arbiters of taste and trends in the computer game business."

The University of Southern California and Pandemic worked with the Army's Research, Development and Engineering Command Simulation Technology Center to bring state-of-the-art technology and reality to the game. The tool took approximately a year and a half to develop.

"Our plan, when we started down this road, was to build a solid training aid that would also be a credible commercial product," Korris said.

Korris estimated the game may be used at the infantry training level sometime this fall or early next year. Two modes—military and commercial—will be available on one disk. A code unlocks the military version for Army use. The main difference is the commercial version is more "game-like," Korris explained. For example, explosions and sound effects might be more dramatic.

Full Spectrum Command, a PC cousin to Full Spectrum Warrior, is already in use at the Army Infantry School in Fort Benning, Ga. Both operate in urban terrain environments, but whereas Full Spectrum Command is aimed at the command level, Full Spectrum Warrior operates on a squadron level.

Maj. Brent Cummings is team chief for the school's Infantry Captains' Career Course. He feels the recent awards reflect well on the partnership between the developers and the infantry.

"It shows that the Infantry School is taking the lead in regards to technology," Cummings said. "In the past, the (school) hasn't been noted for forging new ideas; however, we embrace this new technology…We feel it will make us better prepared to train and win future fights."

Researcher Wins NASA Award for Reducing Aircraft Emissions

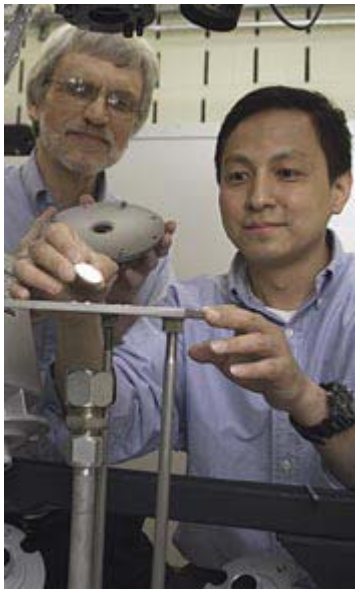
Army Research Laboratory

Adelphi, Md.—A researcher from the Army Research Laboratory is part of a team that recently shared a “Turning Goals Into Reality” Award from the National Aeronautics and Space Administration. The team was awarded for its contributions towards NASA’s objective of reducing aircraft emissions.

Dr. Dongming Zhu, a member of ARL’s Vehicle Technology Directorate, NASA-Glenn Research Center in Cleveland, will share in the award with researchers from the GE Aircraft Engines, Howmet Research Center, NASA Glenn Research Center, Pratt and Whitney and Prazair Surface Technologies.

The Turbine Airfoil System Development Team was honored for the development of a new turbine blade alloy and thermal barrier coating system. With up to an 85 F increase in metal temperature capability over currently used blade alloys, the alloy was selected for use in the high pressure turbine blade of the F135 Joint Strike Fighter engine. It also can be used in commercial or other military applications requiring longer life and lower maintenance. With the incorporation of a new system, the increase in blade surface temperature capability will result in higher engine efficiency and reduced carbon dioxide emissions.

Zhu is a materials engineer whose main job responsibility is developing high-temperature ceramic coatings for gas turbine engine applications.



(at right) Dr. Dongming Zhu of the Army Research Laboratory works with his NASA colleague, Dr. Robert Miller. Both are members of a team that developed a new turbine blade alloy and thermal barrier coasting system for which the team received a "Turning Goals Into Reality" award from NASA.